

## SECTION 72

### COMPRESSED AIR SYSTEM

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#### 72.1 REFERENCES

(72A) Code of Federal Regulations - 46 CFR Sub-chapter F

#### 72.2 INTRODUCTION

This Section contains the Contractor Design and Provide general requirements for Main Engine starting, Ship's Service, and Control compressed air systems.

*For WSF Fleet-wide Standardization purposes, End No. 1 of the Vessel shall always be considered the bow, and this designation shall delineate port and starboard, fore and aft wherever they are addressed in the Technical Specification.*

### 72.3 GENERAL

A compressed air system, consisting of compressors, receivers, distribution piping, fittings, gages, and controls, shall be provided to supply compressed air throughout the Vessel. Primary uses of compressed air shall be as follows: starting of the Main Engines and Ship's Service Generator sets; whistle, sea chest blow down, general Ship's Service distribution system, HVAC, Propulsion Control System, and other control systems.

See Section 74 of the Technical Specification for general piping requirements and material.

### 72.4 AIR COMPRESSORS

A minimum of two (2) air compressors QUINCY Model QR-25, or equal, shall be provided to supply the starting air system, one (1) of which shall be powered from an emergency source. The compressors shall be sized to charge the starting air receivers from atmospheric to design pressure in no more than 45 minutes. The compressors shall be electric motor driven air-cooled, two-stage compressors, 250 psig, with automatic un-loader, adjustable off/on pressure switch, air filter, hour meter and air cooled inter and after coolers, belt guard and accessories; one (1) service and one (1) standby. Automatic start-stop pressure controls shall be provided and set for intermittent operation, with staggered compressor cut-in and cut-out pressures. The motor controls shall include an alternator panel for selection of the lead compressor. The pressure display shall be located on a gage board in a location within the EOS as approved by the WSF Representative. The pushbutton operators and indicators shall be located on the EOS Control Console in a location approved by the WSF Representative. See the *GENERAL* Subsection in Section 85 of the Technical Specification.

The air for the Ship's Service and Control Air Systems shall be provided by the starting air system.

### 72.5 RECEIVERS

A minimum of five (5) compressed air receivers shall be provided: two (2) Starting Air, one (1) Ship's Service Air, and two (2) Whistle Air.

The starting air receivers shall be sized to provide adequate compressed air required for the entire Vessel and at least the minimum number of starts required by the Authoritative Agencies.

The Vessel's service, whistle and control air receivers shall be sized to meet system demands, while providing a not more than 0.5 ( $\leq 0.5$ ) duty factor on the compressors.

Each receiver shall be manufactured and certified to meet American Bureau of Shipping Rules and U.S. Coast Guard regulations. Each receiver shall be fitted with a pressure gage, relief valve, drain connection, inlet and outlet connections and hand holes for cleaning and inspection. Horizontal receivers shall have inlet and outlet connections on opposite heads and as high as possible in the receiver.

The starting air receivers shall be fitted with automatic drains that cycle with the compressors in sequence. See Main Engine start requirements of Section 101 of the Technical Specification.

## **72.6 STARTING AIR PIPING**

The starting air storage and operating pressure shall be not less than 200 psig and not greater than 250 psig. Reducing stations, if required for air starters, shall be of the full flow type with manual bypass. Starting air piping shall be run separate from other Ship's Service compressed air piping. Starting air shall be provided for each Main Engine and Ship's Service Diesel Generator engines transitioning through high pressure flexible connections at the machinery.

## **72.7 SERVICE AIR PIPING**

The Ship's Service Air System shall be fed from the starting air system. The storage pressure shall be not less than 200 psig and not greater than 250 psig, with distribution piping at no more than 125 psig. Reducing stations shall be full flow with manual bypass. Service air shall be provided for, but not limited to, the following systems and compartments:

- A. Ship's whistles (with dedicated receiver, automatic condensate trap and freeze protection at each End of the Vessel).
- B. Blow-down at hose stations (diesel oil transfer, etc.) and Sea Chests.
- C. Vehicle Deck Sprinkling system blow down (connected to the sprinkler manifold).
- D. Tool and service outlets throughout the Vessel.
- E. Oil-fired hot water heater (if necessary).

Tool and service air outlets shall be provided throughout the Vessel. Each machinery space, void, and fan room shall be provided with at least one (1) outlet. Large machinery spaces, such as the Engine Rooms, and Reduction Gear Rooms, shall be provided with at least four (4) outlets (each) disbursed, as approved by the WSF Staff Chief Engineer, throughout each space. See the *ENGINEER'S WORKSHOP AREA AND EQUIPMENT* Subsection in Section 80 of the Technical Specification for Workshop Ship's Service compressed air manifolds requirements. On the Weather Decks, including the Vehicle Decks, an adequate number (minimum four (4) per deck level) of outlets shall be provided, in addition to an outlet in each Rescue Boat Station and the fueling station, such that all deck areas can be reached with no more than 100 feet of hose. All tool and service air outlet station locations shall be approved by the WSF Representative.

Dedicated filters and moisture separators/dryers shall be provided where required by the connected pneumatic equipment, to prevent moisture damage, and at the machinery space tool outlets. Additional moisture separators or dryers shall be provided if necessary to prevent moisture damage of serviced equipment.

For WSF Fleet-wide Standardization purposes, all service stations and hoses shall be provided with  $\frac{3}{8}$ " ID AEROQUIP FD43/FD40 Series, male half (FD40) and female half (FD43) quick disconnect couplings.

In addition to the Ship's Service compressed air manifolds required above for the Workshop, provide one (1) McMASTER-CARR #5216K45, or equal, 25' -  $\frac{3}{8}$ " ID automatic-winding hose reel with steel enclosure assemblies (to include McMASTER-CARR #5585K13, or equal, bumper stop) in the Workshop. See the *ENGINEER'S WORKSHOP AREA AND EQUIPMENT* Subsection in Section 80 of the Technical Specification.

In addition to the hose outlets required above for each Engine Room, provide one (1) McMASTER-CARR #5216K46, or equal, 50' -  $\frac{3}{8}$ " ID automatic-winding hose reel with steel enclosure assemblies (to include McMASTER-CARR #5585K13, or equal, bumper stop) in each Engine Room. Installations shall include all piping fittings, and root ball valve. Location shall be determined by the WSF Staff Chief Engineer.

The Contractor shall provide six (6) 25' -  $\frac{3}{8}$ " ID, four (4) 50' -  $\frac{3}{8}$ " ID, and one (1) 100' -  $\frac{3}{8}$ " ID coupled hose assemblies; McMASTER-CARR #54075K23, #54075K33, #54075K83 respectively, or equal. All hose assemblies with couplings shall be turned over to the WSF Staff chief Engineer.

## **72.8 CONTROL AIR PIPING**

Control air shall be supplied from the Starting Air System through Contractor provided reducing stations, Owner Furnished Equipment (OFE) refrigerated filter/dryers, and a dedicated OFE control air receiver. A control air system shall be provided in accordance with the PSI Contractor's Control System requirements.

## **72.9 INSTALLATION**

The starting air compressors shall be installed on resilient mounts as described in Section 50 of the Technical Specification. All pipe connections to the air compressors and receivers shall be corrugated stainless steel flexible hose with wire-braid, capable of handling hot high pressure air, as set forth in Section 74 of the Technical Specification. Horizontal runs of piping shall be pitched to drain toward the air receivers where possible. Low-points shall be fitted with drain valves located eighteen (18) inches below the main line low-point. Strainers shall protect the air start valves, reducing stations, and other items of equipment supplied with compressed air.

For purposes of minimizing noise during night tie-up, the air compressors shall be located in an acoustic enclosure together with one (1) of the Ship's Service Diesel Generators.

**72.10 CLEANING**

Thoroughly clean all compressed air piping and tubing systems by flushing with hot water and detergent, rinsing, drying and blowing clean and dry filtered air. Each compressed air valve station or service termination shall be demonstrated clean. Compressed air connections shall not be made to any user equipment until the system has been proven clean.

System cleanliness shall be evidenced by passing compressed air through a muslin cloth until there is no visible evidence of accumulated debris and/or restricted flow.

All air receivers shall be cleaned of debris and accumulated moisture removed prior to being closed and placed into service. The closing of the receivers shall be witnessed by the WSF Representative.

**72.11 SPARE PARTS AND INSTRUCTION MANUALS**

Provide a list of recommended spare parts and special tools, for those items which are Contractor furnished, together with parts lists and instruction manuals necessary to maintain and service provided equipment and accessories in accordance with the requirements of Sections 86 and 100 of the Technical Specification.

**72.12 TESTS, TRIALS AND INSPECTIONS**

Tests and/or trials shall be provided in accordance with this Section and Section 101 of the Technical Specification.

Inspections shall be performed as defined in this Section and in Section 1 of the Technical Specification.

**72.13 PHASE II TECHNICAL PROPOSAL REQUIREMENTS**

The following calculations, in addition to other deliverables required by Section 100 of the Technical Specification and the Authoritative Agencies, shall be provided during the Phase II Technical Proposal stage of Work in accordance with the requirements of Section 100 of the Technical Specification:

A. Starting Air Compressor Calculations

B. Receiver Sizing Calculations

C. Piping System Calculations

See Section 100 of the Technical Specification for additional requirements regarding technical documentation.

**72.14 PHASE III DETAIL DESIGN AND CONSTRUCTION REQUIREMENTS**

The following calculations, in addition to other deliverables required by Section 100 of the Technical Specification and the Authoritative Agencies, shall be provided during the Phase III Detail design stage of Work in accordance with the requirements of Section 100 of the Technical Specification:

A. Starting Air Compressor Calculations

B. Receiver Sizing Calculations

C. Piping System Calculations

See Section 100 of the Technical Specification for additional requirements regarding technical documentation.

**(END OF SECTION)**